

WHAT IS CLAIMED IS:

1. In a solid-state radiation detector using a single crystal that comprises the compound semiconductor InSb as the matrix, the improvement wherein the single crystal is one of high-purity InSb that is not artificially doped with impurities, a surface barrier layer being formed on top of the high-purity InSb single crystal to fabricate a semiconductor device provided with diode characteristics and which is operated at a temperature between 2 K and 50 K.
2. In a solid-state radiation detector using a single crystal that comprises the compound semiconductor InSb as the matrix, the improvement wherein the single crystal is one of high-purity InSb that is not artificially doped with impurities, a pn junction being formed in the high-purity InSb single crystal to fabricate a semiconductor device provided with diode characteristics and which is operated at a temperature between 2 K and 115 K.
3. In a solid-state radiation detector using a single crystal that comprises the compound semiconductor InSb as the matrix, the improvement wherein an InSb single crystal is doped with Ge to make a p-type InSb single crystal, a pn junction being formed in the p-type InSb single crystal to fabricate a semiconductor device provided with diode characteristics and which is operated at a temperature between 4.2 K and 115 K.
4. The solid-state radiation detector according to claim 2 or 3, wherein the formation of a pn junction involves

thermal diffusing of Sn to form an n-type electrode.

5. The solid-state radiation detector according to claim 3, wherein on the basis of the fact that when the detector is operated over the temperature range from 70 K to 115 K, the rise time of signals output from a charge-sensitive preamplifier becomes shorter than 1  $\mu$ s on account of reduced trapping of electrons or positive holes, the shaping time constant of a main amplifier is set below 2  $\mu$ s and pulse height analysis is performed to obtain radiation spectra.